WHAT IS CLAIMED IS:

1. A battery, comprising:

a cathode comprising an oxide containing a metal and pentavalent bismuth;

an anode comprising lithium;

a separator between the cathode and the anode; and

an electrolyte.

2. The battery of claim 1, wherein the metal is an alkali metal.

3. The battery of claim 2, wherein the alkali metal is selected from the group consisting of lithium, sodium, and potassium.

4. The battery of claim 2, wherein the oxide is $LiBiO_3$, Li_3BiO_4, Li_5BiO_5, Li_7BiO_6, $Li_4Bi_2O_7$, $Li_5Bi_3O_{10}$ or $KBiO_3$.

5. The battery of claim 1, wherein the metal is an alkaline earth metal.

6. The battery of claim 5, wherein the alkaline earth metal is selected from the group consisting of magnesium, calcium, strontium, and barium.

7. The battery of claim 5, wherein the oxide is selected from the group consisting of $MgBi_2O_6$, $SrBi_2O_6$, $Sr_2Bi_2O_7$, $LiSr_3BiO_6$, $NaSr_3BiO_6$, $Li_2Ba_2Bi_2O_{11}$, and $Ba_2Bi_2O_6$.

8. The battery of claim 1, wherein the metal is a transition metal.

9. The battery of claim 8, wherein the transition metal is selected from the group consisting of scandium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, silver, yttrium, zirconium, niobium, molybdenum, ruthenium, palladium, cadmium, hafnium, tantalum, and tungsten.

10. The battery of claim 8, wherein the oxide is $ZnBi_2O_6$, $Cu_2Bi_2O_7$, $CdBi_2O_6$, $AgBiO_3$, or Sr_2ScBiO_6.

11. The battery of claim 8, wherein the oxide further comprises an alkali metal or an alkaline earth metal.

12. The battery of claim 1, wherein the metal is a lanthanide.

13. The battery of claim 12, wherein the lanthanide is selected from the group consisting of lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, and ytterbium.

14. The battery of claim 12, wherein the oxide further comprises an alkali metal or an alkaline earth metal.

15. The battery of claim 1, wherein the metal is a main group metal.

16. The battery of claim 15, wherein the main group metal is selected from the group consisting of gallium, indium, tin, arsenic, antimony, thallium, and lead.

17. The battery of claim 15, wherein the oxide further comprises an alkali metal or an alkaline earth metal.

18. The battery of claim 1, wherein the oxide comprises an electrically conductive portion.

19. The battery of claim 18, wherein the electrically conductive portion is an electrically conductive surface coating comprising carbon or a metal oxide.

20. The battery of claim 19, wherein the electrically conductive surface coating comprises a material selected from the group consisting of graphite, carbon black, acetylene black, cobalt oxide, cobalt oxyhydroxide, silver oxide, silver nickel oxide, and indium oxide.

21. The battery of claim 20 wherein the carbon black is a highly graphitized carbon black.

22. The battery of claim 1, wherein the cathode further comprises a second oxide that contains a metal and is free of pentavalent bismuth.

23. The battery of claim 22 wherein the second oxide is selected from NiOOH, AgO, Ag_2O, $AgNiO_2$, and $BaFeO_4$.

24. The battery of claim 22 wherein the cathode includes the second oxide in an amount corresponding to a weight fraction of from about one to about 50% based on the combined weight of the metal oxide containing pentavalent bismuth and the second oxide.

25. The battery of claim 1, wherein the anode comprises an alloy comprising lithium.

26. The battery of claim 1, wherein the electrolyte is non-aqueous.

27. The battery of claim 26, wherein the electrolyte comprises an organic solvent, and a salt that is soluble in the solvent.

28. The battery of claim 1, wherein the battery is a primary battery.

29. The battery of claim 1, wherein the battery is a secondary battery.